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ABSTRACT

This report provides a summary overview of findings in major data and research papers about the implications of information technologies for the home. A full literature review of these works, "The Application and Implications of Information Technologies in the Home," is presented. This study identifies eight core data sets and reviews more than 30 major studies related to information technologies in the home. The major findings are: (1) personal computer (PC) use in the home has spread rapidly, especially among the affluent and well-educated; (2) children and male teenagers continue to be the heaviest users of home PCs; and (3) Internet use has moved from work to home. (CCM)

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NATIONAL SCIENCE FOUNDATION
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COMPLEX PICTURE OF COMPUTER USE IN THE HOME EMERGES

by Maria C. Papadakis

Division of Science Resources Studies

ISSUE BRIEF

March 31, 2000

Since 1994, there has been rapid growth in home PC ownership. Internet access has expanded even faster.

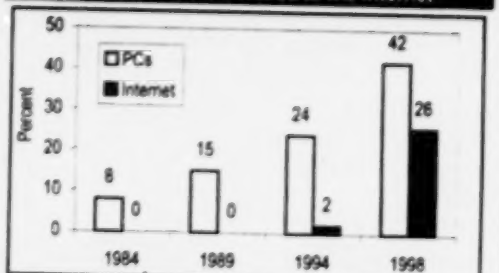
What do we know about the diffusion and use of information technologies (IT) in the home?[1] Twenty years after the advent of the personal computer (PC), the research on IT in the home produces a complex picture of household use.

A new National Science Foundation (NSF) study, *The Application and Implications of Information Technologies in the Home: Where Are the Data and What Do They Say?* <forthcoming at http://srsweb.nsf.gov/it_site/it/infotech.htm> reviews key data resources and research on the impacts and consequences of IT in the home. The study identifies eight core data sets and reviews more than 30 major studies related to IT in the home <http://srsweb.nsf.gov/it_site/html/ho_main.htm>. Some key study findings follow.

PC and Internet Use in the Home Has Spread Rapidly, Especially Among the Affluent and Well Educated

Since 1994, there has been rapid growth in home PC ownership. Between 1994 and 1998, the proportion of households owning a home computer increased by 18-percentage points—that was double the 9-percentage-point increase for the 5-year period from 1989-94 and more than double the 1984-89 7-percentage-point growth (figure 1).

Figure 1. Percentage of U.S. Households Owning a Home Computer and Percentage of U.S. Households with Access to the Internet



SOURCE: All data are from the U.S. Bureau of the Census, Current Population Survey, except the 1994 Internet data point, which is from Peter C. Clemente, *State of the Net: The New Frontier*. (NY: McGraw-Hill, 1998).

[1]As used here, "information technology" is defined as consisting of home computers and other devices for accessing information sources, primarily the Internet. "In the home" refers to the use and implications of IT in or by households, but not by a home office.

Internet access has expanded even more rapidly, with the proportion of households connected to the Internet jumping from 2 percent of all households in 1994 to 26 percent in 1998.

Patterns of diffusion and adoption clearly suggest that IT is still very much a resource acquired by more affluent and well educated Americans. Although PCs have been diffusing rapidly in recent years, rates of adoption are still lower in poor and minority households compared to affluent and white homes. The research on both PC and Internet adoption indicates that socioeconomic factors (such as income, level of education, and marital status) and demographic factors (such as age, sex, and race/ethnicity) continue to be the variables most correlated with home IT adoption.

The Digital Divide Is Widening

The growing access to home computing has not been evenly distributed. The National Telecommunications and Information Administration (NTIA) has repeatedly identified a "digital divide" in the United States, defined as a home computing gap between white and affluent Americans and those who are ethnic minorities or poor. Although disadvantaged groups *have* substantially increased their home access to computers and the Internet, the gap between these groups and white Americans is growing. Using data from the Current Population Survey conducted by the Census Bureau, the NTIA found that the digital divide is worsening among Americans <http://www.ntia.doc.gov/ntiahome/digitaldivide/>.

From 1994-98, the gap in PC ownership between white and African American and Hispanic households widened, as did the gap between rich and poor. Although ownership of home computers and Internet access increased in all income and racial/ethnic categories during these 4 years, the disparity in ownership has widened. For example, in 1998, 46.6 per-

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cent of white Americans owned a home computer compared to 23.2 percent of African Americans, a gap that increased by nearly 7-percentage-points over 1994.

These ethnic differences cannot be accounted for solely by affluence: within every income category, African Americans lag substantially behind white Americans in their adoption of home computers and linking to the Internet, although the gap is not as large at higher income levels. The NTIA reports that "The role of race or ethnic origin is highlighted when looking at similarly situated families. A White, two-parent household earning less than $35,000 is nearly *three times* as likely to have Internet access as a comparable Black household and nearly *four times* as likely to have Internet access as Hispanic households in the same income category" (NTIA, *Falling Through The Net: Defining the Digital Divide*, July 1999, p. 6). Relatedly, geographic location has an additional impact on both household PC ownership and Internet access. Homes in rural areas are less likely to own PCs or be connected to the Internet even when income is held constant in statistical analyses.

Research indicates that socioeconomic and demographic factors continue to be the variables most correlated with home IT adoption.

Certain groups thus appear to show consistently lower levels of home IT access, particularly households that are low income; African-American, Hispanic, or Native American; less educated and single-female-headed; or located in the south, rural areas, or central cities.

Children and Male Teenagers Continue to Be the Heaviest Users of Home PCs

The recent wave of home computer adoption has gone largely unexamined by scholars and analysts, in contrast to the "early adopter" research on home computing during the early-to-mid 1980s. This early research suggested that the pri-mary uses of home computing were for education, play, work, and basic word processing. Sizable proportions of early adopters found that they used the computer less than they initially expected: in one long-term study, nearly one-fifth of families had quit using the PC entirely within two years of purchase. It is not clear whether this underutili-zation of the home computer was due to the inability of the technology to meet needs within the family, the relative lack of quality software for these early computers, or other factors.

Overall, the early research findings generally suggested that children and male teenagers tended to use home PCs more often and for longer periods than adults. Strong differences by sex appeared in some early adopter studies. Women and girls overall appeared to use the computer less often and less intensively than their male counterparts, and were much less likely to be heavy users of the technology. Children tended to use the computer for games, learning, and writing in roughly balanced proportions—no one application dominated use, although game playing was the most common reason children gave for using the computer. Recent research on Internet use reinforces some of the impressions generated by the early computing studies: children and male teenagers still tend to be the heaviest users of IT.

Internet Use Has Moved From Work to Home

Americans now access the Internet primarily from home rather than at work. A 1997 survey reports that 75 percent of Internet users access it at home, and 46 percent exclusively so.[2] Both e-mail and World Wide Web activity dominate home Internet use, and, in general, it appears that e-mail may be the more important activity. In one study, researchers found that people use e-mail more frequently than they do the Web and will use e-mail first in on-line sessions that include both e-mail and Web activity.[3] Indeed, people who used e-mail more than the Web were more likely to continue using the Internet over the course of a year than people making greater use of the Web.

Specific informational content derived from the World Wide Web is relatively unique to each in-

[2] Peter C. Clemente, *State of the Net: The New Frontier*. NY: McGraw-Hill, 1998.

[3] Robert Kraut et al., "Communication and Information: Alternative Uses of the Internet in Households." In *CHI '98: Proceedings of the 1998 Conference on Human Factors in Computing Systems, Association for Computing Machinery Special Interest Group on Computer-Human Interaction*, Los Angeles: Association for Computing Machinery, 1998, pp. 368-75.

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In the future, more complex studies should produce a richer picture of the many factors that interact to determine IT use.

dividual's interests and needs. Of the roughly 10,000 unique addresses visited during one study of families' on-line activities, 55 percent were accessed by only one person and less than 2 percent were visited by 20 percent or more of the individuals in the sample; these tended to be search engines and Web portals.[4] Usage is nonetheless patterned by broad categories. In terms of general information searches, the American Internet User Survey, <http://www.cyberdialogue.com/>, reveals that health and medicine is the most popular Internet subject. Thirty-six percent of all users—and 47 percent of female users—report exploring this subject. Other major areas of interest include entertainment, music, parenting/children, and life-styles subjects. The NTIA also reports distinctive patterns of home Internet use <http://www.ntia.doc.gov/ntiahome/digitaldivide/>. In general, individuals with higher income and higher education levels are far more likely to use the Internet for work-related activity, while minorities and unemployed individuals tend to use the Internet for employment searches and taking educational courses.

Home IT Use Has Both Beneficial and Harmful Impacts

Research on the actual impacts of IT on the home, family, and individual household members is *extremely limited in scale and scope*. The five areas of impact covered in the project report are (1) time displacement (the impact of computer use on other household and leisure activities), (2) teleworking/telecommuting, (3) psychological well-being, (4) informatics and health care, and (5) video games and children.

Time Displacement

Home computing and Internet use do not yet appear to substantially displace other forms of home media and entertainment (reading, watching television, listening to the radio or stereo). While there does appear to be some slight displacement of television viewing, several analysts suggest that PCs and the Internet are media enhancing: people begin to use other forms of media more often as they use home information technology more intensively.

[4]Robert Kraut et al., "The HomeNet Field Trial of Residential Internet Services." *Communications of the ACM*, 1996, 39 (12), pp. 55-63.

Teleworking and the Home

The research on teleworking generally predates major changes in distributed work arrangements in large-scale organizations, so the findings may have limited applicability to the contemporary workplace (the studies reviewed in the literature address teleworking in the late 1980s and early 1990s). Studies indicate that telework can demonstrably enhance people's ability to better balance work and family needs and reduce personal stress. On the other hand, telework can also disrupt important family dynamics and relationships and create psychological isolation and low self-esteem. Most research on telework/distributed work focuses on efficiency and productivity, and not on the impacts on individual workers or their homes.

Psychological Well-Being

Evidence is mixed with regard to various competing theories about the impact of computing on individuals. Some data suggest that increasing Internet use is associated with social isolation, withdrawal, stress, and so forth, although Internet "addiction" may be limited to about 10 percent of Internet users and is not necessarily associated with how much time an individual actually spends on-line. Conversely, some studies suggest that Internet use enhances family connectedness and friendship formation since e-mail and multi-user domains may foster communication between family members and friends.

IT and Healthcare

Health informatics is an emerging class of tools designed to help individuals understand their medical conditions and participate more effectively in decisions about treatment and care. For example, videos, interactive CD-ROMs, and on-line databases allow patients to gather more detailed information about their illnesses and treatment options than is typically possible in discussions with a physician during an office visit. The limited research on home health informatics suggests that patients who used these tools had higher levels of understanding about their medical conditions and treatment choices than those who did not.

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Video Games and Children

The impact of video games on children may provide insight into the impact of computer games on children. Evidence is found for both positive and negative behaviors associated with the use of video games, but also for neutral out-comes: these games do not necessarily have any observable effect on children. For example, video game playing does not necessarily make children less sociable, and these games do appear to be more intellectually challenging and stimulating than television on several key empirical measures of both affect and stimulation. Of cause for concern is boys' strong preference for more aggressive video games, and for these preferences to be associated with more aggressive behavior and reduced sociability.

Caveats and Gaps in Knowledge

Researchers use models appropriate to knowledge and data available at the time they conduct their studies. As more work is done, new hypotheses are identified for exploration and test with new and better data and models. When researchers develop models more complex than those reported here, they will build a richer picture of the many variables that interact to determine the use of IT in the home and its implications. See *The Application and Implications of Information Technologies in the Home: Where Are the Data and What Do They Say?* <forthcoming at http://srsweb.nsf.gov/it_site/it/infotech.htm> for information about the research methods used to produce the findings summarized above. This report also discusses gaps in current knowledge about the implications of IT in the home, as well as the availability and utility of existing data.

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